REMARKS

At the outset, the Examiner is thanked for the thorough review and consideration of the subject application. The Office Action of March 14, 2003 has been received and contents carefully reviewed.

By this Amendment, Applicant cancels claims 4, 8, 13 and 17, and amends claims 1, 5, 9, 22 and 24. Accordingly, claims 1-3, 5-7, 9-12, 14-26 and 28-29 are currently pending in the present application. Reexamination and reconsideration of the application are respectfully requested.

In the Office Action, the Examiner objected to claims 1, 5, 9, 23 and 24 because of informalities; rejected claims 1-3, 5-7, 9-11, 14-20, 23-26, 28 and 29 under 35 U.S.C. § 102(e) as being anticipated by Kim (U.S. Patent No. 6,327,011); rejected claims 4, 8, 13 and 27 under 35 U.S.C. § 103(a) as being unpatentable over Kim as claims 1, 5, 9 and 24 above, in view of Otaki et al. (U.S. Patent No. 6,509,076); rejected claim 12 under 35 U.S.C. § 103(a) as being unpatentable over Kim as claim 9 above, in view of Walters et al. (U.S. Patent No. 6,150,430); and rejected claim 21 and 22 under 35 U.S.C. § 103(a) as being unpatentable over Kim as claim 9 above, in view of Dob (U.S. Patent Application Publication No. US 2002/20079289). Applicants respectfully traverse these rejections.

In the Office Action, the Examiner objected to claim 23 for insufficient antecedent basis. (Office Action, p. 2). However, claim 23 does not have the limitation, "etching the glass substrate", as cited by the Examiner, but claim 22 has it. Therefore, Applicant assumes that the Examiner meant to object to claim 22.

Accordingly, Applicant amended claims 1, 5, 9, 22 and 24 to cure the minor inconsistencies pointed out by the Examiner. Applicant believes that the objections to the claims are now moot. Again, Applicant appreciates the Examiner's thorough review of the present application.

The rejection of claims 1-3, 5-7, 9-11, 14-20, 23-26, 28 and 29 under 35 U.S.C. § 102(e) as being anticipated by Kim is respectfully traversed and reconsideration is requested.

Claims 1, 5, 9 and 24 are allowable over the cited references in that claims 1, 5, 9 and 24 recite a combination of elements including, for example, "wherein the passivation layers include one of BenzoCycloButene (BCB) and photo-acrylate." None of the cited references, singly or in combination, teaches or suggests at least this feature of the claimed invention. Accordingly, Applicant respectfully submits that claims 1, 5, 9 and 24 are allowable over the cited references.

The rejection of claims 4, 8, 13 and 27 under 35 U.S.C. § 103(a) as being unpatentable over Kim as claims 1, 5, 9 and 24 above, in view of Otaki et al., the rejection of claim 12 under 35 U.S.C. § 103(a) as being unpatentable over Kim as claim 9 above, in view of Walters et al., and the rejection of claim 21 and 22 under 35 U.S.C. § 103(a) as being unpatentable over Kim as claim 9 above, in view of Dob are respectfully traversed, as Kim is not prior art under § 103(c).

Under 35 U.S.C. § 103(c), subject matter developed by another person which qualifies as prior art under 35 U.S.C. § 102(e) shall not preclude patentability under 35 U.S.C. § 103 where the subject matter in the claimed invention were, at the time the invention was made, owned by the same persons or subject to an obligation of assignment to the same person. As set forth in M.P.E.P. § 2141.01, for patent applications filed prior to November 29, 1999, 35 U.S.C. § 103(c) is limited to subject matter developed by another person which qualifies as prior art only under 35 U.S.C. § 102(f) and 35 U.S.C. § 102(g).

The present application (application serial number 10/025,765) and Kim (U.S. Patent No. 6,327,011) were, at the time of the invention of the present application, made and owned by LG. Philips LCD Co., Ltd. Therefore, Applicant respectfully requests that the rejections be withdrawn as Kim is not valid prior art.

Moreover, Applicant is submitting herewith a certified translation of the Korean priority document to perfect the claim for priority.

Applicant believes the foregoing amendments place the application in condition for allowance and early, favorable action is respectfully solicited. If the Examiner deems that a telephone conference would further the prosecution of this application, the Examiner is invited to call the undersigned attorney at the telephone number (202) 496 - 7500. All correspondence should continue to be sent to the below-listed address.

If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 C.F.R. §1.136, and any additional fees required under 37 C.F.R. §1.136 for any necessary extension of time, or any other fees required to complete the filing of this response, may be charged to Deposit Account No. 50-0911. Please credit any overpayment to deposit Account No. 50-0911.

Dated: July 10, 2003

Respectfully submitted,

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(Translation)

THE KOREAN INDUSTRIAL PROPERTY OFFICE

This is to certify that the following application annexed hereto is a true copy from the records of the Korean Industrial Property Office.

Application Number : Patent Application 85558/2000

Date of Application : December 29, 2000

Applicant : LG. Philips LCD Co., Ltd.

Commissioner

(Translation)

[Document Name] Written Application for Patent
[Classification] Patent
[Attention] Commissioner of the Korean Industrial Property Office
[Reference] 0087
[Date of Submission] December 29, 2000
[Title of Invention] LIQUID CRYSTAL DISPLAY DEVICE AND METHOD FOR THE SAME

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[Subject of application] Pursuant to Art. 42 of the Patent Law, we apply as above.

Patent Attorneys Yong In KIM
Chang Sub SHIM

[Fees]

[Basic pages]	15 pages	29,000 won
[Additional pages]	0 page	0 won
[Priority]	0 sets	0 won
[Request for Examination]	0claims	0 won
[Total]		29,000 won

[Affixes]
- A Copy of Abstract and Specification(and Drawings)

CERTIFICATE OF VERIFICATION

I. Su Hyun LEE of 648-23 Yeoksam-dong, Kangnam-ku. Seoul. Korea state that the attached document is a true and complete translation to the best of my knowledge of the Korean-English language and that the writings contained in the following pages are correct English translation of the specification and claims of the Korean Patent Application No. P2000-85558.

Dated this 8th day of July, 2003.

Signature of translator: _____

Su Hyun LEE

[ABSTRACT]

A display panel is disclosed, which includes etched first and second substrates, a liquid crystal layer between the first and second substrates, and a transparent passivation layer on an outer surface of the substrate. At this time, the passivation layer such as BCB or photoacrylate is deposited on the substrate damaged by the etching process, so that the substrate is protected and flattened, thereby improving picture quality of the display panel.

[TYPICAL DRAWINGS]

FIG. 3C

[INDEX]

etching, organic layer

[SPECIFICATION]

[TITLE OF THE INVENTION]

LIQUID CRYSTAL DISPLAY DEVICE AND METHOD FOR MANUFACTURING THE SAME

[BRIEF DESCRIPTION OF THE DRAWINGS]

FIG. 1 is a sectional view of a general display panel.

FIG. 2A and FIG. 2B are sectional views of a display panel before and after etching according to a related art.

FIG. 3A to FIG. 3C are sectional views illustrating manufacturing process steps of a display panel according to the present invention.

FIG. 4 is a sectional view of the display panel according to the present invention.

Description of reference numerals for main parts in the drawings

1: backlight	2-1, 2-2: polarizers
3, 10: first glass (transparent) substrate	4, 17: second glass (transparent) substrate
5, 16: liquid crystal	6, 18, 26: sealing pattern
11: groove	12: transparent passivation layer
23: lower substrate	24: upper substrate
25: intermediate substance layer	13a: gate electrode
13b: gate insulating layer	13c: semiconductor layer
13d: source electrode	13e: drain electrode
14: passivation layer	15: pixel electrode

[DETAILED DESCRIPTION OF THE INVENTION]

[OBJECT OF THE INVENTION]

[FIELD OF THE INVENTION AND DISCUSSION OF THE RELATED ART]

The present invention relates to a glass substrate for a display panel, and more particularly, to a display panel using a glass substrate, in which it is possible to prevent the glass substrate from being damaged by scratches from etching and/or polishing and uneven etching and/or polishing.

In recent, research of flat panel displays such as liquid crystal display (LCD), plasma display panel (PDP), electroluminescent display (ELD), vacuum fluorescent display (VFD), etc., is being performed and these displays are being used in various apparatuses.

For example, in case of the LCD devices, even though the LCD devices are being used as display devices in portable televisions and notebook computers, there are various problems to be solved. Especially, the portable televisions or notebook computers are obtaining the popularity due to their lightness in weight. A main component of technology development is to decrease their weight. To this end, there are specific efforts to decrease the weight of the LCD device itself.

In order to decrease the weight of the LCD device, various methods may be tried. . However, LCD device structure and current technology limit the decrease of weight and size to the main elements of the LCD device. In the meantime, a glass substrate, which is one of the most basic elements of the LCD device, still has margin to decrease the weight of the LCD device according to developments in processing technologies. Since the glass substrate occupies most of the total weight of the LCD device, research for decreasing the weight of the glass substrate is being performed for

the purpose of decreasing the weight of the LCD device.

For decreasing the weight of the glass substrate, its thickness should be decreased preferentially. However, if the thickness decreases below a specific value, the glass substrate is broken during its processing or cracks are generated. Therefore, there is a limitation in decreasing the thickness of the glass substrate.

As a way for decreasing the thickness of the glass substrate, after an LCD panel is fabricated using a glass substrate having the specific thickness or more, a surface of the glass substrate is etched by dipping the glass substrate in a container that is filled with an etchant. However, this method has disadvantages in that the glass substrate is unevenly etched due to the incompleteness of the glass substrate itself, or foreign particles generated during the etching process are again attached to the etched surface of the glass substrate and thus the surface of the glass substrate becomes irregular.

In case of etching the substrate to be thin greatly, the substrate may be cracked or damaged due to the irregular surface when the LCD device is pressed during the manufacturing process. That is, current technology limits the decrease of scratch or groove of the glass substrate by the uneven etching, or the thinness of the glass substrate. Also, during the etching process, the foreign particles are attached to the surface of the glass substrate since the foreign particles are not removed perfectly, whereby the surface of the glass substrate becomes irregular.

FIG. 1 is a cross-sectional view of a general substrate. For example, an LCD device will be described as follows. As shown in FIG. 1, the general LCD device includes a first transparent substrate 3, a second transparent substrate 4, and liquid crystal 5 changed according to an electric field between the first and second transparent substrates 3 and 4. Then, the liquid crystal 5 is sealed by a sealing pattern 6, and

polarizers 2-1 and 2-2 are formed on outer surfaces of the first and second transparent substrates 3 and 4. Also, a backlight 1 is formed below the first transparent substrate 3 for providing lights.

At this time, a generally used substrate has a thickness of 1.1mm, which is relatively thick, so that the generally used substrate is safe physically and thermally during etching process. If a thin substrate is used from an initial stage, production yield is deteriorated. Further, an array process of the first transparent substrate 3 is performed at a temperature between 200℃ and 300℃. In this respect, it is disadvantageous that the thin substrate is used from the initial stage since it is hard to perform the manufacturing process steps smoothly. Accordingly, it is useful to use the thick substrate in the initial stage, and to obtain the thin substrate by etching the thick substrate.

That is, as shown in FIG. 2A, the first and second transparent substrates 3 and 4, each having the thickness (t), are etched after performing the manufacturing process steps. Then, referring to FIG. 2B, during the etching process for making the substrates to have the thickness (t'), grooves 11 or scratches occur in the glass substrates.

[TECHNICAL TASKS TO BE ACHIEVED BY THE INVENTION]

However, when chemical etching and mechanical polishing process is performed to the transparent substrates, the grooves and scratches occur in the substrates, whereby the surface of the substrate becomes irregular. This results in that dot or spot defects occur on a screen during driving the display panel.

Accordingly, the present invention is directed to a display panel that substantially obviates one or more problems due to limitations and disadvantages of the

related art.

An object of the present invention is to provide a display panel, in which a transparent organic layer such as BCB or photoacrylate is deposited on a surface of a glass substrate damaged by etching and/or polishing processes, so as to repair the damaged surface of the glass substrate, thereby improving picture quality.

[PREFERRED EMBODIMENTS OF THE INVENTION]

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a display panel according to the present invention includes two substrates, at least one of the two substrates having etching and/or polishing process, an intermediate substance layer between the two substrates, a sealing pattern sealing the intermediate substance layer, and a transparent passivation layer on an outer surface of the substrate formed by the etching and/or polishing process.

The substrate formed by the etching and/or polishing process includes a glass substrate, and the transparent passivation layer includes an organic layer. Also, the organic layer is formed in a spin coating method, and the organic layer includes BCB or phoyoacrylate, in which a refractive index difference is within 10%.

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, an LCD device according to the present invention includes first and second glass substrates having etching and/or polishing process, a liquid crystal layer between the first and second glass substrates, a sealing pattern sealing the liquid crystal layer, and transparent passivation layer formed on outer surfaces of the first and second glass substrates.

The transparent passivation layer includes an organic layer, and the organic layer is formed in a spin coating method. Also, the organic layer includes BCB or photoacrylate, in which a refractive index difference is within 10%.

In the present invention, the transparent passivation layer is formed on the glass substrate, so that it is possible to prevent the glass substrate from being irregular due to grooves and scratches, and to prevent the thickness of the glass substrate from being uneven.

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

A display panel according to the preferred embodiments of the present invention will be described with reference to the accompanying drawings.

FIG. 3A to FIG. 3C are sectional views illustrating manufacturing process steps of a display panel according to the present invention. First, as shown in FIG. 3A, lower and upper substrates 23 and 24, each having a thickness (t), are formed, and an intermediate substance layer 25 is injected between the lower and upper substrates 23 and 24.

Then, the lower and upper substrates 23 and 24 are sealed by a sealing pattern 26. At this time, a total thickness of the lower and upper substrates 23 and 24 is similar to a profile thickness of a display panel. In this case, the lower and upper substrates 23 and 24 may have different thickness initially, or any one of the lower and upper substrates may be formed of a glass substrate. In the preferred embodiment of the present invention, both the lower and upper substrates are formed of the glass substrates.

When using chemical and/or mechanical methods for decreasing the thickness of

the lower and upper substrates 23 and 24, as shown in FIG. 3B, etching and/or polishing process is performed to the lower and upper substrates 23 and 24, whereby the lower and upper substrates 23 and 24 are respectively thinned at a specific thickness (t'). At this time, it is possible to control the substrate at a desired thickness.

In the aforementioned chemical method for etching the substrate by using a strong etchant, a physical force is not given to the substrate, so that the substrate is not damaged. The mechanical method is to polish the assembled substrates as sandpaper or polisher during spraying coolant on the assembled substrates.

However, as shown in FIG. 3B, if the lower and upper substrates 23 and 24 are etched by the chemical etching and/or the mechanical polishing processes, grooves 11 are formed in the surface of the substrate or scratches occur on the surface of the substrate due to unevenness of the etching process.

Accordingly, referring to FIG. 3C, a transparent passivation layer 12 is formed for flattening the surfaces of the lower and upper glass substrates 23 and 24. At this time, the passivation layer 12 is formed of an organic layer in which a refractive index difference of the lower and upper substrates 23 and 24 is within 10%. The organic layer is formed by a spin coating method. The organic layer includes BenzoCycloButene (BCB) or photoacrylate. In this method, if both the lower and upper substrates are formed of glass, the lower and upper substrates are thinly formed. Also, even if one of the lower and upper substrates is formed of glass, the lower and upper substrates are thinly formed.

FIG. 4 is a cross-sectional view schematically illustrating a display panel according to the present invention. For example, an LCD device according to the present invention will be described as follows. As shown in FIG. 4, the LCD device

according to the present invention includes a second transparent substrate having a black matrix layer and a color filter layer (not shown). a first transparent including a plurality of thin film transistors TFTs in respective pixels (for convenience. a unit pixel region is shown). and liquid crystal 16. At this time. the liquid crystal 16 is sealed between the first and second transparent substrates by a sealing pattern 18. Also, a transparent passivation layer 12 coated and flattened in a spin coating method is formed on the first transparent substrate.

A method for manufacturing the aforementioned LCD device will be described as follows.

First, a gate line (not shown) and a gate electrode 13a are formed on a first transparent substrate, and an insulating layer 13b is formed thereon to cover the gate electrode 13a. Then, a semiconductor layer 13c is formed on the insulating layer 13b. Subsequently, an ohmic contact layer (not shown) is formed for an ohmic contact of the semiconductor layer 13c, and then source and drain electrodes 13d and 13e are formed. After that, a passivation layer 14 is formed on an entire surface of the first transparent substrate including the source and drain electrodes 13d and 13e, and then a patterning process is performed thereon, thereby exposing a predetermined portion of the drain electrode 13e. Then, a pixel electrode 15 is formed for being connected to the exposed portion of the drain electrode 13e.

Next, a sealing pattern 18 is formed on any one of the first and second transparent substrates, the first transparent substrate having a thin film transistor, and the second transparent substrate having a black matrix layer and a color filter layer. Then. the first and second transparent substrates are assembled to each other. and the assembled substrates are etched in an etching apparatus with a strong etchant. As a

result. the first and second transparent substrates are thinly formed as reference numerals 10 and 17.

Also. the liquid crystal 16 is not dispensed on the substrate. After forming the sealing pattern 18 having one injection hole to any one of the first and second transparent substrates. the first and second transparent substrates are assembled to each other. Then. the first and second transparent substrates are thinly formed as reference numerals 10 and 17 by using a chemical method, and then the liquid crystal is injected between the first and second transparent substrates, and the injection hole is sealed. The sealing pattern 18 may doubly be formed to prevent the etchant from being permeated into the substrates. Accordingly, the thin and light substrate is obtained, and the thickness of the substrate is controlled according to a temperature change in an exothermic reaction between the substrate and the etchant.

Also, in addition to the chemical method, the substrate may be formed thinly in a mechanical polishing method.

The etching process is performed in an etching apparatus provided with etching, cleaning and drying portions. At this time, the substrates are etched by the etchant filled in a container of the etching portion, and then the etchant remaining on a surface of the substrate is removed in the cleaning portion. Subsequently, the substrate is dried in the drying portion, so that the substrate is completed.

On finishing the etching process of the substrate, the fine scratches of the substrate are polished. Then. a plurality of liquid crystal cells, which are formed in one substrate. are divided into one cell by a cutting process. After cutting the substrate. the liquid crystal 16 is injected into a space between the substrates through the injection hole and the cut substrates are sealed by the sealing pattern 18. Therefore. the process

steps are completed. The substrates may be assembled with each other by another method, and then the liquid crystal is injected therebetween. Subsequently, the etching process and its later process steps are performed.

After the assembling process, the substrates are thinly formed in the etching process. However, the substrates may have defects such as grooves 11, so that it is hard to obtain flattened substrates 10 and 17. Accordingly, a transparent passivation layer 12 is coated on outer surfaces of the transparent substrates 10 and 17, thereby flattening the transparent substrates. The transparent passivation layer 12 flattens the outer surfaces of the transparent substrates by coating an organic substance such as Benzocyclobuten BCB or photoacrylate in the spine coating method. Also, the transparent passivation layer 12 uses the organic substance in which refractive index difference of the transparent substrates 10 and 17 is within 10%.

The transparent substrates 10 and 17 flattened with the transparent passivation layer 12 are applicable to a display panel as well as to an LCD device. Although not shown, polarizers are attached to outer surfaces of the transparent passivation layer 12, and a backlight is formed below the first transparent substrate 10, the backlight serving as a light source.

[ADVANTAGES OF THE INVENTION]

As mentioned above, the LCD device and the method for manufacturing the same have the following advantages.

In the display panel according to the present invention, it is not required to use the unstable thin glass substrate from the initial stage. That is, the inexpensive and stable glass substrate is used for the display panel according to the present invention.

6. The method of claim 5, wherein the passivation layer is an organic layer.

7. The method of claim 6, wherein the organic layer includes Benzocyclobuten BCB or photoacrylate.

8. The method of claim 6, wherein a liquid crystal layer is formed after assembling the first and second substrates to each other.

FIG. 1
Related Art

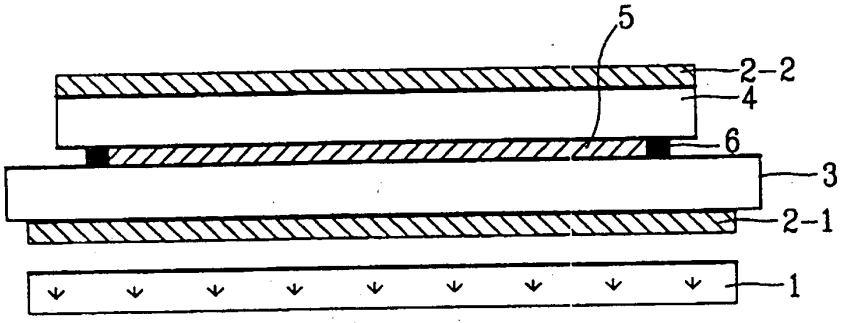

FIG. 2A
Related Art

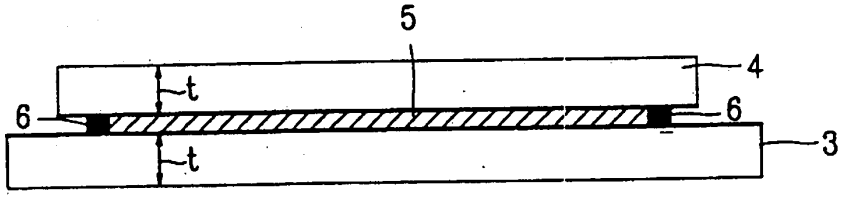

FIG. 2B
Related Art

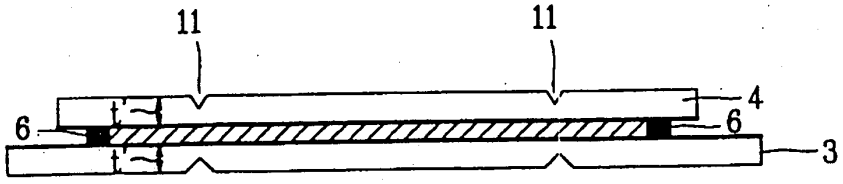

FIG. 3A

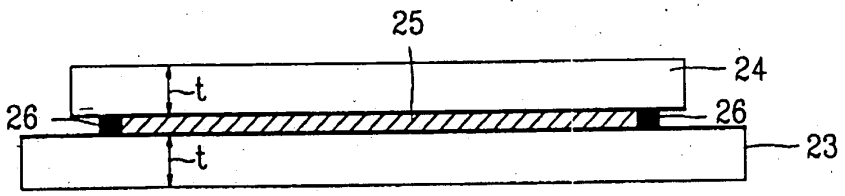

FIG. 3B

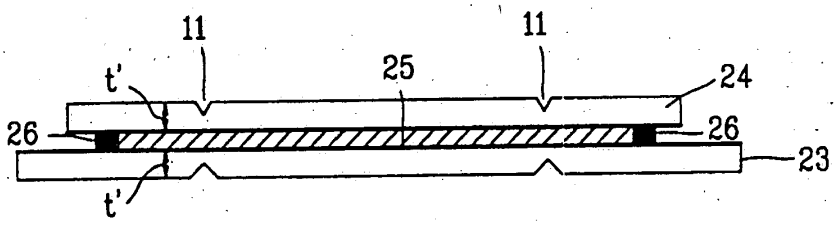

FIG. 3C

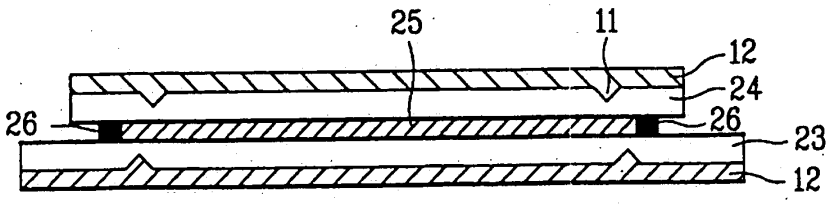

FIG. 4